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ABSTRACT

A project which developed a retrieval system to evaluate the advantages and disadvantages of an interactive computer and video display system over traditional methods for using a slide library is described in this publication. The art school slide library of the University of Iowa stores transparencies which are arranged alphabetically within historical periods. Study cards, prints, and photographs supplement the collection. A subset of these-- 1000 black and white, glossy, 5" x 7" photographs of woodcuts and engravings by Albrecht Durer and by Raimondi--were selected as the sample for this retrieval project. These original photographs were transferred single frame to 16mm film. From this film the transmissive videodisc was mastered and pressed. The following information on each photo was then entered into files on the computer: videodisc frame number; the Bartsch catalog number; the artist's name, the medium used, the date of completion; the state of rendition; title; and theme. Users can use any of these variables to retrieve the photos. The entire system was installed in the art school for evaluation by faculty, staff, and students. The major strengths of the system were identified as speed, ability to retrieve large amounts of information in one place, coordinating verbal information with visuals, research possibilities, and fun. Major weaknesses were poor image quality, the inability to compare two images simultaneously, the inability to interrupt the search, and the limited range of material on the system. Overall, the system was viewed favorable, subject to improvements and modifications.

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Art History Interactive Videodisc Project at The University of Iowa

Historische Bilder Entwerft in seinem Alter
Des L. VI. Jansz



AL MIO C. C. M. GIO: PIETRO TRANQUILLI PIT. ROM. D.
FA. Manfredo ha intagliato l'Anno M.DLXXXV. in Siena

A Report by Dr. Joan M. Sustik

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Introduction

Can a videodisc and computer make life any easier for art historians and others who want to extract information from a library of a quarter million or more pictures? The staff of the Computer-Assisted Instruction Laboratory at The University of Iowa, in conjunction with persons from the Office of Visual Materials in the School of Art and Art History, developed and evaluated a retrieval system built around an intelligent videodisc.¹ The art school slide library stores transparencies which are arranged alphabetically within historical periods. Study cards, prints, and photographs supplement the collection. The retrieval system described in this report used a subset of these materials in order to evaluate the advantages and disadvantages of an interactive computer and video display system over traditional methods for using the slide library.

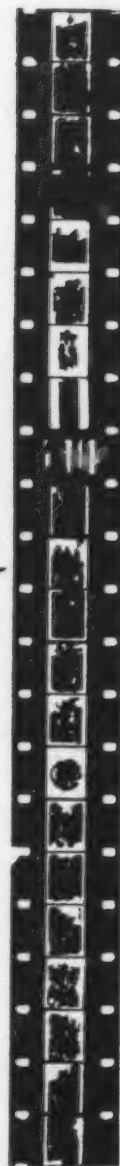
A long-play record-sized optical videodisc stores audio and video information which can be played through a standard television receiver. Each side of the disc provides 54,000 tracks. Each track stores information for reconstructing a separate, colored image which can be displayed without wear on either the disc or player. Any one of the 54,000 tracks can be located (or "accessed") in five seconds or less by a microprocessor-controlled videodisc player. Such videodisc players can be operated manually by keys located on either the player or keypad. The player can also be put under the direct control of a computer in an arrangement known as an "intelligent videodisc system." By itself, a videodisc can store approximately 100,000 images, but would require a manual search for each image. In and of itself, a computer could store descriptive data and cataloging information for each image, but it cannot display the pictures. Combining their abilities, an intelligent videodisc system lends itself to art retrieval wherein the visual images reside on the videodisc and the program for accessing and describing the image is on the computer.

The original print was a 5" x 7" black and white glossy photograph with the Bartsch classification information.

Images were transferred to 16mm film by The University of Iowa Motion Picture Unit. This is a segment from the work print showing Dürer's St. Stephan and the Two Bishops.

B. VII
P. 138
It. 109

ALBRECHT DURER



Program Development

One thousand black and white, glossy, 5" x 7" photographs of woodcuts and engravings by Albrecht Dürer and by Raimondi were selected as the sample for this retrieval program. These photographs are part of the over 21,000-image Bartsch collection of works in the British Museum's Department of Prints and Drawings acquired by Iowa's School of Art and Art History from the Warburg Institute in London. These images provided a good test for resolution. In 1979 several members of the art faculty criticized the color fidelity of an early sample videodisc. We chose black and white pictures so that the project could be developed, tested, and judged without worrying about color accuracy.

The original photographs were transferred single frame to 16mm film by The University of Iowa Motion Picture Unit. A black paper border fitted to the edge of each print eliminated distracting white space around the video display. From this film, Thomson-CSF engineers mastered and pressed the transmissive videodisc at their Paris, France, laboratory in the fall of 1979.

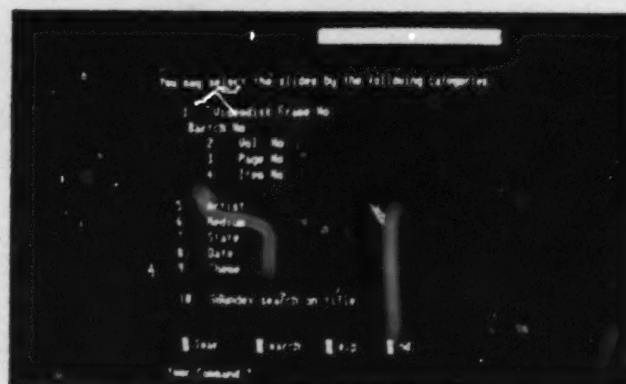
On a worksheet completed for each image we wrote the videodisc frame number, the Bartsch catalog number, the artist's name, the medium used, the date of completion, the state of rendition, and title as well as theme of each image. The art history staff suggested these data as being the most frequently used for locating images in the slide library. This information was then entered into files on the computer for later use in the interactive program.

The complete retrieval system required two kinds of computer programs. The first allows the videodisc player to operate under computer control and was developed by the CAI staff independently of the art history project.

The second is the retrieval program itself. The retrieval program presents the user with a list of criteria for choosing pictures stored on the videodisc. Users can select by videodisc frame number if they have used the system before and know a specific image they want to see. Each image in the Bartsch collection also carries a unique catalog number consisting of volume, page, and item, according to Bartsch's *Le Peintre Graveur*. Therefore, images can also be retrieved by specifying all or part of the Bartsch number. For example, if a user specifies only "Volume XIV," then all images in this volume of the collection will be displayed. Specifying volume, page, and item is equivalent to requesting a particular videodisc frame number since only one image is associated with the request.

Descriptive information for each image recorded on worksheets was later included in the computer data base.

ART HISTORY - VIDEOISC WORKSHEET			
FRAME NUMBER: <u>28 752</u>			
BARTSCH NUMBER: Volume VII <u>X</u>		Page <u>138</u>	Item <u>109</u>
Volume VIII _____		Page _____	Item _____
Volume IX _____		Page _____	Item _____
ARTIST: <u>X</u> 1. 430	MEDIUM: <u>X</u> 1. Woodcut	STATE: _____	DATE: <u>1514</u>
<u>2.</u> 438	<u>2.</u> Engraving		NO DATE: _____
THEME: <u>1.</u> Historical		<u>7.</u> Life of Mary	
<u>2.</u> Landscape		<u>8.</u> Madonna and Child	
<u>3.</u> Portrait		<u>9.</u> Other Religious	
<u>4.</u> Genre		<u>10.</u> Mythological/Allegory	
<u>X</u> 5. Saints		<u>11.</u> Miscellaneous	
<u>6.</u> Life of Christ			
TITLE/SUBJECT: <u>St. Stephen & 2 Bishops</u>			
WORK SPACE:			



Options selected by the user define the category of images to be viewed.



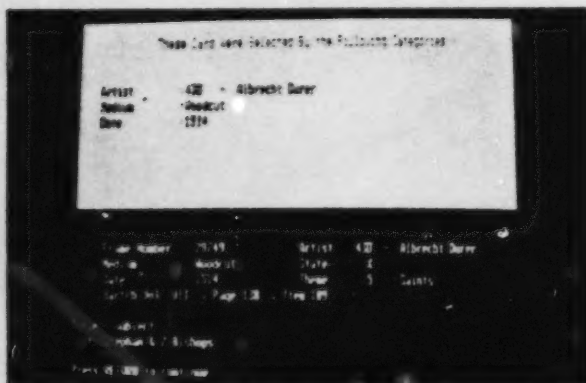
In this instance, the user has selected Dürer, woodcuts, and the year 1514.

First-time users are more likely to use verbal specifications. They can select by artist (Dürer, or Raimondi), date, medium (woodcut or engraving), state (if the print was completed in stages), or by theme (such as "life of Christ"). Specifying more than one variable, such as "Dürer," "Woodcut," and "1514," restricts the members of the subset that will be chosen and displayed. A more general kind of verbal request uses a "Soundex Code." This allows users to specify a word in order to find all images using that word in their title. For example, users can specify "dragon" if they are seeking an image titled "St. George and the Dragon" but are unsure of or do not wish to view all the images listed by artist or by theme.

The program for carrying out these instructions resides on a Hewlett-Packard 2000 time-sharing computer. The program identifies all images corresponding to the categories selected, controls the videodisc player causing it to display each image on a monitor, and lists information related to each image on an adjacent video display terminal. The image and its associated information are displayed for an unlimited time, allowing users to choose their own pace. When an image is shown, users can stop the series by typing in any letter followed by pressing the return key. To proceed to the next image, however, they merely press the return key. This instructs the program to begin a sequential search through the data base for the next appropriate image and associated information. Typing "help" on the keyboard brings a summary of commands and capabilities on the terminal display.



The Bartsch image is displayed on the TV monitor.



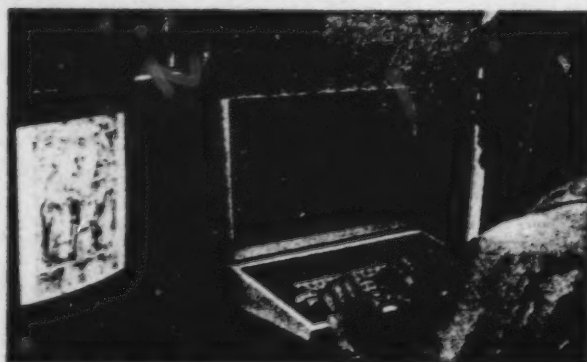
Descriptive information for each image is shown on a video display terminal.

Evaluation

We installed the entire system in the slide library of the art school from December 1 through 11, 1980 for evaluation by faculty, staff, and students. Despite a temporary installation that relied on telephone lines and acoustic couplers, mechanical difficulties were infrequent. Normal, minor operating problems were encountered with the computer system; the videodisc player itself was totally reliable.

The curator of the visual materials assumed primary responsibility for the system. We wanted the system evaluated on its merits without forcing first-time users of the computer to overcome traditional frustrations. The curator set up the system daily and had the program ready to run. Written instructions placed near the terminal described the program and how to run it. Reading the instructions before using the system was optional. If users chose not to read them, the curator explained operating procedures.

Users were requested, but not required, to complete a three-page survey of their reactions to the system (see appendix A). In addition, the curator recorded incidental comments and concerns not anticipated in the survey. Many people inspected the project casually but did not complete the survey; their comments are also taken into consideration in this evaluation.



Janet Miller, curator, Office of Visual Materials, uses the interactive videodisc retrieval system.

Survey Results

Sixteen people completed the survey; three were faculty members, three were staff members, and ten were students. Nine of the latter were graduate students in art history who may well be faced with making decisions about the use of such technology in the near future. Obviously our small population precludes a major of statistical analysis and suggests instead a qualitative interpretation of responses.

Items 1 through 7 gathered demographic data on users. Items 8 through 15 evaluated specific components of the retrieval program. The results are as follows.

Item 8 (future use): Survey responders indicated almost unanimously that they would use the system again if it were available in the future. Fourteen out of fifteen persons were positive; no other question yielded this degree of agreement.

Item 9 (written instructions): On the whole, people who read the written instructions thought them unclear. Unsolicited comments on the border of several surveys indicated objections to "computer jargon" like the use of the word "menu" to mean table of choices. While this is familiar to the point of convention among computer users, it disconcerted the art historians.

Item 10 (help options): Six of the nine persons who used the help options rated them above average in usefulness.

Item 11 (retrieval options): A majority (11 of 14) felt the display of options was easy to use.

Item 12 (TV image): The majority (10 of 16) of responders rated the image quality below average.

Item 13 (computer keyboard): The computer keyboard presented no difficulty; 9 of 16 responders rated it above average in ease of use.

Item 14 (image information): Half of all responders rated the thoroughness of information as average.

Item 15 (staff assistance): Staff assistance was overwhelmingly rated above average.

The seven subscales of item 16 tried to measure a preference for either locating images by hand in ordinary slide drawers or by using the intelligent videodisc system. A majority (10 of 15) preferred the videodisc system when speed was considered. Similar ratings were given to ease of use and finding needed information (9 of 15 and 8 of 14 respectively). A majority preferred the videodisc system for research potential (12 of 14). For displaying pictures in lecture rooms, however, the majority (11 of 14) preferred traditional slides and projectors. A smaller majority (8 of 14) preferred the use of a slide projector for individual ease in

Verbal Comments

viewing images. Consistent with results on "potential for research," a majority (10 of 13) preferred the videodisc system for getting information on images.

To suggest an overall judgment for or against the videodisc method, one could average the ratings for each responder on item 16. An average score of 1.0 would show a strong preference for the slide and projector method; an average of 2.0 would suggest preference for the innovation. The means of six responders fell between 1.00 and 1.49 while the means of the other ten fell between 1.50 and 2.00, indicating a distinct preference for the videodisc.

Item 17 contained 12 semantic differential subitems. These were designed to assess an overall reaction to the videodisc retrieval system. Appropriate subitems were transformed so that a 1 was positive and 5 was negative. Summing across subitems yielded a total score for an individual with a potential range of 12 (positive) to 60 (negative). The group mean for item 17 was 26.6 which indicates a slightly positive attitude toward the videodisc system. Individual means ranged from 12 to 36.

Open-ended responses solicited in items 18, 19, and 20 are included in the appendix B. The major strengths of the system were identified as overall speed compared to using the slide drawers, ability to store and retrieve large amounts of information in one place, coordinating verbal information with visuals, research possibilities, and being fun.

Major weaknesses were identified as poor image quality, the inability to compare two images simultaneously (a procedure that is germane to art history), frustrating delay on certain individual searches, particularly those using the Soundex code, the inability to interrupt the search, and the limited range of material on the system.

Suggestions for future systems included putting the entire slide collection on videodisc, putting selected subspecialties on videodisc, programming an interruptible search process, providing more information, providing ability to zoom in on details, avoiding computer language, providing color, and projecting images on a wall-size screen. Each of these features can be readily incorporated in a revised program.

In addition to the summarized objective data from the survey, readers may be interested in generalized comments and attitudes. People's attitudes toward the intelligent videodisc shifted from discomfort, suspicion, and tension on the first day to a more tolerant if not accepting attitude by the end of the evaluation. While we cannot say that familiarity spawned fondness, it probably fostered respect for the unique characteristics of the system.

Questions and concerns were raised orally about the ability to standardize key words or titles, such as "Nativity," "Birth of Christ," and "Adoration." Various cataloging techniques were suggested such as alphabetical or chronological. A suggestion was made that retrieval be contingent on a range of dates rather than a specific date, such as "circa 1514" where all images produced between 1510 and 1519 would be identified.

Some users wanted additional features. A few wanted the entire screen filled with the image as well as the ability to zoom in on details. This desire was possibly instigated by viewing a Discovision videodisc in which those techniques were used.² Some viewers erroneously assumed that the system used in this study technologically precluded color or zoom in. These are functions of the original videodisc programming, not limitations of the system itself.

Negative comments were made on the written instructions, search time, computers in general, and a concern over the utility of the system when "rush slides" are needed (visual material requested in short notice). Occasionally the Soundex code overgeneralized, identifying "sword" for "shroud" for example. There was doubt that the system could provide visual support for lectures when traveling outside The University.

Some questioned whether the primary purpose of the system was for research or for classroom instruction. Some faculty were very positive and saw possibilities for use in their own specialty. However, it would be erroneous to say that all faculty members were equally enthusiastic about the system. Among some faculty, one senses a resistance to technology, to meddling with the arts, and a specific contempt for video. Some people merely dismissed the system. Others expressed their negative attitudes, such as "\$600 for this and we can't even get travel funds or paper clips?" (The charge for transferring the originals to 16mm film was \$600.) Others were averse to the prospect of what they termed a "canned lecture," a direct response to the impressionistic instructional disc. Others viewed it as a toy, with benefits not commensurate with costs.

Discussion

Image quality aroused major concern. In general, students of art, accustomed to using high quality prints or slides, seemed dissatisfied with the video resolution available through current technology. In designing videodisc applications, however, one should ask whether the image quality is acceptable for the given purpose, not whether a video image is as accurate as an image projected from a photographic transparency or a print. We did not poll users to find out whether (as they judged image quality) they thought the purpose was for retrieval, for referencing an image available in another format, for use as a visual equivalent to prints and slides, or for possible uses in instruction.

User preference for the videodisc system in research acknowledges the utility of making textual and iconographic information available.

Slides were preferred over videodisc for classroom use. This judgment may be traced to the small image size on the monitor, or to the perceived complexity of the machinery involved. Investigation of an interactive system in a large group is needed.

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Another consistent concern was the speed with which the intelligent videodisc completed requested operations. As with any time-sharing system, there were hours of peak load when many other users slowed down response time. A more specific problem arose with using the Soundex code. The Soundex code operates by translating the target word into a numerical code and comparing it to the similarly derived numerical code of every word in the title. Whereas the Soundex procedure could be more efficiently programmed, our experimental Soundex method slowed down the system to the point of user irritation. This was aggravated by the fact that once a search was begun it could not be interrupted, leaving the user no choice but to wait for completion. The system was viewed as tedious, but not boring. This may indicate that the system as a whole was interesting, but that the time delays, perhaps the lack of mobility compared to wandering through a slide collection, was in fact tedious.

From this small-scale exploration, we have found some important specifications for the next design. In moving from

an exploratory project to a full-scale application, we would incorporate the features suggested, namely, include detailed close-ups, use a range of dates, revise written instructions, reduce search time, and expand content areas.

In summary, the faculty, staff, and students were critical in their analysis of the intelligent videodisc retrieval system. The major criticism involved image quality; a lesser criticism involved search time. High resolution systems, presently unavailable, would help alleviate the first objection. For any permanent application, other more complex and costly programming techniques could reduce the search time and give users more control over stopping specific searches.

Beyond technical matters lie the deeper issues of adapting to change and of paying for innovations. Neither is trivial in human terms. Concerning change, faculty need to be informed about the role of the videodisc system. They need to be reassured that while the videodisc can facilitate retrieval and thereby enhance both research and classroom presentation, slides will not be replaced. Concerning budget, funding for any project, existing or proposed, is likely to be viewed as poaching on other needed expenses, particularly if long-term ratios of cost to benefits are not considered.

Acceptance and change are not likely to occur overnight or in a ten-day period. The overwhelming indication of future use by the responders suggests that the system, though viewed critically, was viewed favorably, subject to improvements and modifications.

¹The CAI Lab at Iowa has conducted intelligent videodisc research and development since the fall 1978. The system used in the art history retrieval program consists of a Thomson-CSF TTV-3620 educational/industrial videodisc player, a 48K Apple II computer, HP2000 minicomputer, Superbee CRT terminal, and a Sanyo B/W monitor. The retrieval program resides on the HP; the Apple serves as a communications link between the videodisc player and HP.

²During the second week, a one-day demonstration by a Discovision Associates representative was held showing a color instructional videodisc on impressionist paintings. This contained zoom in and details of many of the paintings and used a Discovision PR 7820 educational/industrial videodisc player.

Appendix A

Art History Videodisc Survey and Responses

We would appreciate a few moments of your time to help us evaluate the art history videodisc retrieval system. We do not need your name. Thank you.

1. Are you: faculty 3 staff 3 student 10
(19%) (19%) (62%)
2. Age _____
3. Sex: Male 5 Female 11
(31%) (69%)
4. Have you used a videodisc player before? Yes 3 No 16
(19%) (81%)
5. Have you used a computer before? Yes 8 No 8
(50%) (50%)
- 5a. Have you used this particular system before?
Never 11 Once 2 Twice 0 Over two times 3
(69%) (12%) (19%)
6. How much time did you spend with the system this time?
1-10 min 1 10-20 min 9 20-30 min 2 30-60 min 2 over 1 hour 1
(7%) (60%) (13%) (13%) (7%)
7. Why did you use the system?
Just curious 5 To become familiar 8 Class assignment 2
(31%) (50%) (13%)

Locate specific information 0 Part of a demonstration 1
(6%)

Other (please describe) _____

8. If you had the need, would you use the system again? Yes 14 No 1
(93%) (7%)

For each of the following please place a check mark closest to the adjective which most clearly represents your feelings. Your responses may vary from item to item. Your first response is most important.

9. manual describing the system
very useful 1 1 6 2 2 not at all clear 4
(6%)(6%)(38%)(12%)(12%) Not used
(25%)
10. help options
very useful 1 5 2 1 1 not at all useful 4
(7%)(36%)(14%)(7%)(7%) Not used
(29%)
11. retrieval menu
very easy to use 3 8 2 1 0 very hard to use
(21%)(58%)(14%)(7%)(7%)
12. image of print on TV
quality usable 0 2 4 8 2 quality unusable
(12%)(25%)(50%)(12%)(7%)
13. computer keyboard
very easy to use 5 4 6 1 0 very difficult to use
(31%)(25%)(38%)(6%)(6%)
14. information (e.g., title, dates) for images
more thorough than necessary 1 1 7 4 1 inadequate
(7%)(7%)(50%)(29%)(7%)
15. staff assistance
excellent help 12 2 2 0 0 inadequate help
(75%)(12%)(12%) Not used

16. Which would you prefer for the following considerations? Place a check mark.

	present cabinet storage system	videodisc system
speed	<u>5</u> (33%)	<u>10</u> (67%)
ease of use	<u>6</u> (40%)	<u>9</u> (60%)
finding what you need	<u>6</u> (43%)	<u>8</u> (57%)
potential for research	<u>2</u> (14%)	<u>12</u> (86%)
use in a classroom	<u>11</u> (79%)	<u>3</u> (21%)
ease of viewing images	<u>8</u> (57%)	<u>6</u> (43%)
getting information on images	<u>3</u> (23%)	<u>10</u> (77%)

Again, please place a check mark closest to the adjective which most clearly represents your feelings. Your first response is most important, and your responses may vary.

17. In general, I felt that the videodisc retrieval system was:

helpful	<u>5</u> (33%)	<u>6</u> (40%)	<u>3</u> (20%)	<u>0</u>	<u>1</u> (7%)	not helpful
comfortable	<u>5</u> (33%)	<u>8</u> (53%)	<u>2</u> (13%)	<u>0</u>	<u>0</u>	not comfortable
tedious	<u>0</u>	<u>5</u> (33%)	<u>5</u> (33%)	<u>0</u>	<u>5</u> (33%)	not tedious
hard	<u>0</u>	<u>3</u> (19%)	<u>6</u> (38%)	<u>4</u> (25%)	<u>3</u> (19%)	easy
interesting	<u>8</u> (50%)	<u>8</u> (50%)	<u>0</u>	<u>0</u>	<u>0</u>	uninteresting
not useful	<u>2</u> (12%)	<u>0</u>	<u>4</u> (25%)	<u>6</u> (38%)	<u>4</u> (25%)	useful
boring	<u>0</u>	<u>1</u> (6%)	<u>4</u> (27%)	<u>4</u> (27%)	<u>6</u> (40%)	not boring
not difficult	<u>5</u> (33%)	<u>4</u> (27%)	<u>4</u> (27%)	<u>1</u> (7%)	<u>1</u> (7%)	difficult
exciting	<u>2</u> (14%)	<u>5</u> (36%)	<u>6</u> (43%)	<u>1</u> (7%)	<u>0</u>	dull
professional	<u>5</u> (38%)	<u>3</u> (23%)	<u>4</u> (31%)	<u>1</u> (8%)	<u>0</u>	unprofessional
fast	<u>3</u> (20%)	<u>2</u> (13%)	<u>6</u> (40%)	<u>4</u> (27%)	<u>0</u>	slow
practical	<u>3</u> (20%)	<u>4</u> (27%)	<u>7</u> (48%)	<u>1</u> (7%)	<u>0</u>	impractical

Appendix B

Responses to Open-Ended Items*

Question #18—The major strength of the system is:

- fast, fun
- speed and (I hope) trustworthiness—assuming cataloging is accurate and complete
- the ability to give a fairly quick general view of an image
- ability to store large amounts of information and sort through it
- speed
- potential for iconographic research, speed, classroom flexibility, creative teaching possibilities
- potential information stored
- images easier to see
- collecting the information in one place
- ease of selection of the image
- ready retrieval of frequently used images
- quick, visual, accessible, and fun to tinker with
- possibilities for research
- coordination of visual with information

Question #19—The major weakness of the system is:

- areas too broad and number of items too few
- quality of image, not really knowing total quantity of images stored
- confusion, because unless staff person who's here and isn't then it becomes very confusing to use
- fuzziness of image
- poor quality of the image at present and small size difficult to add images readily
- slow search period
- images cannot be compared when only one can be seen at a time
- can't see 2 images at once, details are blurred, image hurts eyes too much, color?
- speed in searching, time in cataloging, poor imagery, not sharp
- you can't stop searching
- slowness of search time, errors in programming information
- difficult to see details on image—more categorical breakdown w/indices
- quality of image, limited reference material i.e., Bartsch as source
- poor image quality

Question #20—Suggestions for future systems:

- Bartsch (spelling)—Can the slide collection be videodiskd?
- Pre-Columbian American material; African and Oceanic Images
- I could use one with images of Etruscan engraved mirrors and/or Greek vases
- stop searching
- more information, details, continue search with pushing return like a 15 second time
- zoom in on details
- more explanation on how to correct errors (erase) and start over (gave manual a 3)
- avoid computer language or provide a glossary before giving instructions
- projected images
- more tapes, greater iconographic correlation, use of color for images

*Responses exactly as written on questionnaire.

This project was funded primarily by The University of Iowa Office of Research and Development and the Weeg Computing Center. The School of Art and Art History assumed the costs of transferring the original photographs to film; they also provided cataloging information and cooperated fully in the evaluation.

The people in the Weeg Computing Center who contributed to this project are: Dr. Joan M. Sustik, project coordinator; Dr. Bobby R. Brown, former director, CAI Lab.; William Bonney, Jr., programmer; staff members of the Computer-Assisted Instruction Laboratory; and Dr. David B. Thomas, evaluation, Instructional Services staff. Dr. Wallace Tomasini, director of the School of Art and Art History, and Janet Miller, curator in the Office of Visual Materials, were also instrumental in the development of this project.